only different developments of the same fundamental ideas.

In recent years, Prof. Levi Civita has published a number of papers in the *Atti dei Lincei* dealing with particular solutions of the equations of dynamics, and in especial with stationary motions. At the invitation of Prof. Dickstein he has now prepared a simplified account of these researches for the transactions of the "Prac matematyczno fizyczynych," published at Warsaw. The original starting point of the investigation was the method of ignoration of coordinates, but the conclusions have now been shown to be results of a general principle applicable to any system of ordinary differential equations. They form a development of the work of Routh, and the stationary motions investigated by the author of "Rigid Dynamics" are shown to belong to a particular class to which Prof. Levi Civita gives the name of "mouvements à la Routh."

G. H. B.

A TREATISE ON CHEMISTRY.

A Treatise on Chemistry. By Sir H. E. Roscoe, F.R.S., and C. Schorlemmer, F.R.S. Vol. i. The Non-Metallic Elements. New edition, completely revised by Sir H. E. Roscoe. Pp. xii+931. (London: Macmillan and Co., Ltd., 1905.) Price 21s. net.

SIR HENRY ROSCOE is to be heartily congratulated by all chemists on the appearance of a new edition of the first volume of Roscoe and Schorlemmer's "Treatise on Chemistry." This volume deals chiefly with the non-metallic elements, and is now in its third edition.

Many chemists remember the interest which the first appearance of this volume excited in 1877. Printed in large clear type, with excellent illustrations, it was recognised both here and on the Continent as a clear and readable account of the facts relating to the chemistry of the non-metallic elements. If the student failed to find in it any new light on the obscurities of chemical theory, he at any rate was put in possession, not merely of the facts, but of the facts stated with a due regard for the history of their discovery which was then and is still foreign to the ordinary "handbook." There were, moreover, many experimental details of service to workers in the laboratory recorded in the volume which were at that time not easily accessible to the ordinary student. During the nearly thirty years which have elapsed since the first edition appeared, many treatises have been published in other languages, notably in German, but the treatise of Roscoe and Schorlemmer still retains a certain individuality for which it will be valued.

In preparing this edition Sir Henry Roscoe has had the valuable assistance of several collaborators with special knowledge, and their handiwork is to some extent evident in the different literary treatment which may be discerned in various sections of the book.

The first section of the volume relates to the general principles of the science, including a description of the properties of gases and liquids, and a very intelligible account of the development of the atomic theory. A clear sketch is given of the theory of electrolytic dissociation. This portion of the volume would have been improved by some concrete illustrations of the methods of determining atomic weights. As it is, the reader must be very much at sea in understanding what this constant actually means, apart from the implications of the atomic theory.

The remainder of the book is occupied with an account of the properties and modes of preparation of each of the non-metallic elements and their chief compounds. The history of each element is succinctly and well described, and important industrial applications are also alluded to. There is an excellent account of the modern manufacture of illuminating gas and of acetylene, as well as of the commercial processes adopted for the production of a number of the elements and their compounds which find industrial uses.

There is also a very complete account of the preparation and properties of the new gases of the atmosphere, argon, &c., which, while interesting, does not throw any new light on the obscure chemical relationships of these elements. In this connection the absence of an account of the periodic classification under the general principles of the science is specially felt. It would have been better to have included in the first part of this volume a complete consideration of the general principles of chemistry, including the determination of atomic weights, instead of reserving the discussion of the periodic classification and other matters of principle for the subsequent volume relating to the metals.

When the first edition of this volume appeared, many of the lecture experiments described were new, and were of interest and value to the teacher. A number of these are now generally familiar, whilst some of those still described have since been improved upon. This feature is indeed no longer a striking one in the book. Very few new lecture or laboratory experiments are included. The teaching of chemistry is, however, no longer conducted on the old lines, and perhaps the teacher would not now look to a treatise of this kind for this information. The fact that in some sections of the work pains are taken to describe fully striking lecture experiments whilst in other and newer sections this aspect is entirely neglected is a defect in the general plan of the book which might be remedied in future editions.

This raises the question as to the characters which such a work as this should possess to be of real utility at the present day. Handbooks and text-books of chemistry for the teacher abound, many of them excellent as practical guides to the work of the lecture room and laboratory. Then there are more ambitious works purporting to be of the nature of treatises. These, however, are too often ill-assorted and ill-considered collections of the facts and theories of chemistry utterly lacking in those literary qualities without which no work of the kind can expect to appeal to the general reader or to take any permanent place in the literature of the science. There is still room for a treatise in the broad sense of the word, in which the facts and doctrines of modern chemistry are expounded in a lucid manner free from the details and technicalities which are essential in a handbook or

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text-book. Such a work should appeal to the teacher and to the student as a work of reference, and also to the outsider, it may be a worker in another department of science, who wishes to understand what the science of chemistry now is without being confronted with all the bewildering and conflicting details of the subject, such as the advanced student may find in Watts's Dictionary or in many German works on chemistry.

Such a treatise, perfect as a broad and general description and discussion of the science of chemistry, has not yet been written in English. Roscoe and Schorlemmer's treatise, however, still remains the nearest approach to the ideal.

POPULAR EVOLUTIONARY THEORY.

Darwinism and the Problems of Life; a Study of Familiar Animal Life. By Prof. Conrad Guenther. Translated by Joseph McCabe. Pp. 436. (London: A. Owen and Co., 1906.) Price 12*s.* 6*d.* net.

THIS is a disappointing book. The idea of using the common sights and sounds of nature which are open to general observation as material for building up a detailed comprehension of evolutionary theory is a good one; there is much to be said for the inductive system of instruction as a supplement to the deductive methods more often employed. But in this particular instance the errors in matters of fact are so prominent and so numerous as to overshadow such merit as the plan of the work possesses. Some of these mistakes must be laid to the charge of the translator, who obviously is but imperfectly acquainted with the subject-matter of his original, and whose want of due care appears in the occurrence of such phrases as "the grouping of their elements is different from in dead albumen," "Pentastomum has little of the characteristics of a spider, to which it really belongs," and of such unwonted forms as "terrestial," "adaption," "caracoid," "strepsitera"—the last two being found more than once. "Sexually," on p. 301, is clearly intended for "non-sexually." "An example of a genius under the generic title" is capable of easy emendation, but "weel" (p. 220) almost baffles conjecture. Can it be meant for "valve"?

The "processionary butterfly" is, of course, a moth; the "tentacles" of the stag-beetle (p. 91) are apparently its mandibles; we hear for the first time of the "bones" of articulates, and that our muscles are "secretory products." It is implied on p. 143 that the adder is not poisonous. This is surprising until we find from other passages that the author's "adder" is not an adder at all, but the harmless ringed snake. A sentence on p. 226 is absolutely unintelligible, unless we may conjecture that the word "falls" is an attempt to render the German "Fälle," here obviously used in the sense of "cases."

It is charitable to the author to suppose that not he but his translator is responsible for the statement that "in the case of moths and grasshoppers there is not a very great difference in habits between the larva and the imago." But when we find it stated that "in the grasshoppers the front extremities have become a powerful leaping apparatus"; that an insect is covered with "dust" by the "stigma" of a flower; that "if we take two beetles that seem absolutely like each other and only differ in size" they are of different species; that "the frogs have only one chamber to the heart"; and that "iron is always found combined with sulphur," it is difficult to avoid the conclusion that the author has to answer for mistakes of his own.

There are advantages in using the popular names of natural objects in a book intended mainly for the unlearned. But a protest must be entered against the slovenly habit, too common with translators, of contenting themselves with a literal rendering of such names into another language. How, for example, is the English reader to identify the "small nocturnal peacock's eye"? If the scientific name be disallowed, at least the recognised English popular title should be given.

Many of the author's conclusions on the main subject are sound enough. It is the more to be regretted that his statements of fact are so often open to adverse criticism, and that he has been, on the whole, so badly served by his translator. F. A. D.

OUR BOOK SHELF.

Aufnahme und Analyse von Wechselstromkurven. By Dr. Ernst Orlich. Pp. viii+117. (Brunswick: F. Vieweg and Son, 1906.) Price 3.50 marks.

IN the usual handbooks on alternating currents the methods of study of the wave-form of the alternations and the analysis of the curves of E.M.F. and current obtained are usually treated very scantily. Recently, however, the subject has attracted considerable attention, and its importance to a station engineer, who wishes to make alternators not identical in design run well in parallel, is now recognised.

Prof. Orlich, of the Reichsanstalt, has endeavoured in this little book to present a clear account of what is known on the subject. It begins by definitions and a short mathematical introduction to the use of Fourier series, &c. Then follow descriptions of various methods of taking curves by the point-to-point process, and of the apparatus of Rosa, of Callendar, and of Hospitalier's "Ondographe."

The Braun tube is described and illustrated, but no mention is made of the fact that owing to the kathode-ray bundle not being composed of rays of the same magnetic deflectability, and the consequent lack of sharpness of the moving image, its use for the study of alternating currents is limited rather to qualitative than to quantitative work. The next chapter deals with oscillographs in their various forms. Their theory is discussed, and the advantages of the different patterns of moving needle and bifilar instruments pointed out.

The recent experiments on telephony of Mr. Duddell, and the wonderful curves shown by him at his recent lecture at the Royal Institution on the analysis and transmission of sounds, show that substantial advances have recently been made in the construction of very sensitive oscillographs of his pattern, the curves of currents furnished by an ordinary microphone being readily shown to a large audience.

After a chapter on the phenomena of resonance, the concluding portion of the book deals with the analysis of curves, with descriptions of the best-known forms

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